

Vegetation establishment in the mitigation billabong at the Olentangy River Wetland Research Park, 2000-2002

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Introduction

A 2.8-ha mitigation wetland was constructed in 1996 and planted in May 1997 at the Olentangy River Wetland Research Park (ORWRP) (Mitsch et al., 1998). This wetland was constructed as partial mitigation for 1.1 ha (2.88 acres) of wetland impacts detailed in the U.S. Army Corps of Engineers Nationwide Permit issued on 26 October 1995 for the Mid-American Waste Systems in Fairfield County. Since the initial planting, wetland vegetation has been monitored and reported annually (e.g., Mitsch et al 1998, Bouchard et al. 1999). This report represents the results of two separate vegetation surveys conducted in October 2000 and July 2002.

Methods

Site description

This 2.8-ha (7-acre) mitigation wetland resembles an oxbow wetland and has been called a "billabong", after the Australian term for oxbow. It is seasonally fed by the Olentangy River flooding. It is also believed to be fed by groundwater on a seasonal basis. The southern portion of the wetland is typically inundated with some water throughout the year. This portion of the wetland was constructed at variable depths to include deepwater areas (> 15 cm), shallow water (0 to 15 cm) and exposed mudflats. The perimeter of the wetland basin was designed with long slopes (banks at an 8:1 slope) to encourage plant diversity and zonation. In May 1997, vegetation planted in the billabong included: *Cephalanthus occidentalis* L., *Sagittaria latifolia* Willd., *Equisetum* sp., *Zizania aquatica* L., *Iris versicolor* L., *Spartina pectinata*, *Lobelia cardinalis* L., *Saururus cernuus* L., *Juncus effusus* L., *Asclepias incarnata* L., *Pontederia cordata* L., *Scirpus cyperinus* (L.) Kunth, *Sparganium eurycarpum*, *Alisma plantago-aquatica* L., *Scirpus americanus* Pers., *Scirpus fluviatilis*, *Acorus calamus* L., *Potamogeton pectinatus* L., *Polygonum* spp., and *Schoenoplectus tabernaemontani* Vahl. Furthermore, native prairie grass and marsh seeds were broadcasted around the perimeter and adjacent upland zones of the excavated basin area (Mitsch et al., 1998).

Passive management of the billabong wetland has been consistent during the past two years. Water enters the wetland primarily from the Olentangy River during high water events via a one-way check valve on the inflow and

exits through a control-weir structure at the south end of the wetland. At the time of the July 2002 vegetation survey, high flow conditions existed at the two adjacent experimental wetlands and some surface water entered the billabong at its outfall weir through a shared swale system.

Plant diversity

A field vegetation survey of the whole wetland was conducted on during October 2000 and July 2002. Plants were identified and recorded in four separate habitat types: islands, open water/mudflat, and 1-2 ft (30-60 cm) and 2-3 ft (60-100 cm) elevation zones above the mudflat. Meandering transects were conducted throughout the entire wetland, covering each zone. For each species observed, its approximate abundance (relative to total zone area) was estimated in each zone using a qualitative classification scheme (present (0-5%), common (5-50%), or abundant (>50%)). Indicator status using Region 1 (Northeast) National List (Reed, 1988) was determined for all plants identified to species. Species not found in this National List were indicated as non-listed (NL).

Vegetation cover

Based on the observed conditions, a species list and vegetative cover map were prepared. The species list indicates the species observed and their relative abundance in the 2000 and 2002 using the qualitative classification scheme. The map delineates the various dominant vegetation communities observed during July 2002.

Results and Discussion

Species richness

A total of 98 species were identified in the basin during the ground survey in October 2000 and 101 species were identified in July 2002 (Table 1). In 2000, high diversity was found in all the zones of the wetland. Using obligate (OBL) and facultative-wetland (FACW and FACW+) as indicators of wetland species, there were a total of 46 wetland species (27 OBL and 19 FACW) found in the basin. Most of these wetland species were preferentially found in the lower elevation zones such as 1-2 ft. and mudflat habitat. Dominant vegetation in these zones included *Leersia oryzoides* (L.) Swartz, *Echinochloa crusgalli*, *Polygonum lapathifolium*, *Populus deltoides*, *Salix nigra* Marshall, *S. tabernaemontani*, and *Typha* sp. Vegetation in the drier

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Table 1. A total plant species list in the billabong basin during the ground surveys in October 2000 and July 2002
P = present; C = common; A = abundant. Indicator Status: OBL = obligate, FACW = facultative wetland, FAC = facultative, FACU = facultative upland, UPL = upland and NL = not listed.

Scientific Name	Common Name	Indicator Status	July 2002			Oct 2000			
			Mud flat	Is-land	1-2 ft	2-3 ft	Mud flat	Is-land	1-2 ft
<i>Abutilon theophrasti</i>	Velvet-leaf	NL			P				
<i>Acer negundo</i>	Boxelder	FAC+			P			P	
<i>Acer rubrum</i>	Red Maple	FAC			P	P	P	P	P
<i>Acorus calamus</i>	Sweet flag	OBL					P		
<i>Alisma plantago-aquatica</i>	Water plantain	OBL	P		P	P	P/C		P/C
<i>Amaranthus cruentus</i>	Purple amaranth	NL					P	P/C	P
<i>Ambrosia artemisiifolia</i>	Common ragweed	FACU				P		P	
<i>Andropogon gerardii</i>	Big bluestem	FAC		P		P			
<i>Apocynum cannabinum</i>	Indian hemp	FACU	P	P		P	C	P	
<i>Arctium minus</i>	burdock	NL		P		P			
<i>Asclepias incarnata</i>	Swamp milkweed	OBL			P	C	P	C	C
<i>Asclepias tuberosa</i>	Milkweed	NL		P	P	P			P
<i>Asclepias tuberosa</i>	butterfly-weed	NL		P					
<i>Aster novi-angliae</i>	New England aster	FACW							P
<i>Aster vimineus</i>	Small white aster	FAC					P	A	C
<i>Baptisia lactea</i>	white wild indigo	FACU				P			
<i>Bidens cernua</i>	Nodding beggars-tick	OBL					P	P	P
<i>Bidens comosa</i>	Leafy-bract beggars-tick	FACW				P			
<i>Bidens frondosa</i>	Devil's beggars-tick	FACW					P	P	C
<i>Bidens laevis</i>	Brook sunflower	OBL		P			P		P
<i>Bouteloua curtipendula</i>	Side oats grama	NL			P	P			
<i>Bromus ciliatus</i>	brome grass	FACW		P					
<i>Callitriche terrestris</i>	Water starwort	NL						P	P
<i>Calystegia sepium</i>	Hedge bindweed	FAC-		P		P		P	
<i>Carex frankii</i>	Frank's sedge	OBL				P			
<i>Carex lurida</i>	shallow sedge	OBL				P			
<i>Carex vulpinoidea</i>	fox sedge	OBL		P					
<i>Cassia fasciculata</i>	Partridge pea	FACU				P	P		P
<i>Cephalanthis occidentalis</i>	Button bush	OBL	P		P		P		P
<i>Cichorium intybus</i>	Chicory	NL							P
<i>Cirsium arvense</i>	Canada horseweed	FACU		P			P	C	A
<i>Convolvulus spithameus</i>	upright bindweed	NL						P	
<i>Conyza canadensis</i>	Common horseweed	UPL						C	A
<i>Cornus sp.</i>	dogwood	n/a		P					
<i>Crataegus sp.</i>	Hawthorn	n/a		P		P			P
<i>Cyperus acuminatus</i>	short point flat-sedge	OBL			P	P			
<i>Cyperus sp.</i>	flat sedge	n/a			P				
<i>Cyperus strigosus</i>	Straw color flatsedge	FACW				P	P	C	P/C
<i>Daucus carota</i>	Queen Anne's Lace	NL				P	C	C	A
<i>Desmanthis illinoensis</i>	Prairie bundle flower	FAC				P	P	P	
<i>Desmodium canescens</i>	horay tick-trefoil	FAC				P			
<i>Desmodium sessilifolium</i>	sessile tick-trefoil	NL					P		P
<i>Diodia teres</i>	Buttonweed	UPL			P		P		
<i>Dipsacus sylvestris</i>	teasel	NL				P		P	P
<i>Echinochloa crusgalli</i>	Barnyard grass	FACW	C		P	P	A	P	P/C
<i>Eleocharis acicularis</i>	least spike rush	OBL	C		P	A			
<i>Eleocharis obtusa</i>	Blunt spike rush	OBL			P	P			
<i>Eleocharis spp.</i>	Spike rush	n/a	P		P	P	C		
<i>Elymus canadensis</i>	nodding wild rye	FACU+		P		P			
<i>Epilobium glandulosum</i>	Northern willow-herb	NL						P	
<i>Erigeron canadensis</i>	Horseweed	NL		P		P			P/C
<i>Erigeron philadelphicus</i>	Philadelphia fleabane	FACU				P			
<i>Eupatorium perfoliatum</i>	Common boneset	FACW-			P		P	C	
<i>Eupatorium serotinum</i>	white snake root	FAC						P	

Table 1. continued

Rudbeckia sp.	coneflower	n/a					C		C
Rumex crispus	Curly dock	FACU		P		P	P	P	P/C
Sagittaria latifolia	Broad-leaf arrowhead	OBL	P	P			P/C		
Salix alba	white willow	FACW	P	P		P	P		P/C
Salix exigua (interior)	Sandbar willow	NL	P	P		P			
Salix nigra	black willow	FACW-	P	A		P	C		C/A
Schoenoplectus tabernaemontani	Soft-stem bulrush	OBL		P		A			C
Scirpus americanus	three-square rush	OBL		P	P	P/C			P
Scirpus cyperinus	Woolgrass	FACW-		P		P			
Scirpus fluviatilis	River bulrush	OBL				C			P/C
Setaria glauca	yellow bristle grass	FAC			P				
Setaria viridis	Foxtail	NL		P		P	C		C
Silphium perfoliatum	cup-plant	FACU							P
Solanum carolinense	Horse nettle	FACU		P		P	C		P
Solidago altissima	Tall goldenrod	FACU					C		P
Solidago sp.	Goldenrod	n/a				P	P		C
Sorghum halepense	Johnson grass	FACU				P			A
Sparganium eurycarpum	Giant burreed	OBL	P	P		P/C			
Spartina pectinata	Prairie cordgrass	OBL				P			P
Taraxacum officinale	Common dandelion	FACU-		P					
Trifolium hybridum	Alsike clover	FACU			P	P			P/C
Trifolium pratense	Red Clover	FACU			P		P		C
Trifolium sp.	Clover	n/a			p				P
Typha sp.	Cattail	OBL	C	P		A			C/A
Ulmus sp	elm	n/a							P
Verbascum thapsus	common mullein	NL							P
Verbena hastata	Blue vervain	FACW		P		P	P		C
Vernonia gigantea	tall ironweed	FAC			P	P			P
Vitis vulpina	Wild grape	FAC		P		P			P
Xanthium strumarium	Rough cocklebur	FAC	C	P	P				P

zones (2-3 ft. and island habitats) was dominated by facultative and upland species including: *Aster vimineus*, *Conyza canadensis*, *Daucus carota*, *Oenothera biennis*, *Populus deltoides*, and *Solidago sp.* A breakdown of the number of species observed for each indicator status is provided in Figure 1 for each species tabulated in this report (2000 and 2002) and the number of species reported in previous years (1997 and 1998) (Bouchard et al 1999).

In 2002, the highest diversity was found on the slopes (Zones 1-2 ft and 2-3 ft) of the wetland basin. Using obligate (OBL) and facultative-wetland (FACW and FACW+) as indicators of wetland species, there were a total of 55 wetland species (32 OBL and 23 FACW) found in the basin in 2002. Water levels in the wetland were high throughout much of the spring and early early summer months; consequently little emergent vegetation germinated in the mudflat prior to the July 2002 sampling event. At the time of the 2002 sampling, water levels had receded and some ruderal and wetland vegetation (*Xanthium strumarium*, *Eleocharis sp.*, and *L. oryzoides*) had recruited into the large, central mudflat area. Cattails (*Typha sp.*) were abundant in the narrow mudflat portions near the inflow section and the perimeter of the wetland. With the colonization of the mudflat, species richness is expected to continue to increase. Despite the low diversity

in the mudflat, overall wetland species diversity is comparable to previous years. In 2002, two distinct zones were observed along the perimeter of the wetland. The 1-2 ft zone was dominated by a mix of willows (*Salix spp.*) and swamp milkweed (*Asclepias incarnata*). Vegetation immediately landward of the willows (2-3 ft zone) was dominated by miscellaneous wetland sedges and macrophytes including: *Eleocharis spp.*, *Scirpus americanus*, *L. oryzoides*, *A. incarnata*, and *P. deltoides*.

Species richness was relatively consistent throughout the monitoring period with no conclusive trends observed. The number of FACW species increased moderately for each year the wetland was monitored. Over the past five years, certain species have declined in abundance while others have increased. Early colonizing species such as *D. carota*, *C. canadensis* and *Cirsium arvense* that were dominant in the 1-2 ft and 2-3 ft zones in earlier surveys (Bouchard et al., 1999), have declined in abundance. Other species such as *S. americanus* and *A. incarnata* have become more prevalent. In the wetter habitats (1-2 ft and mudflat zone) it is more difficult to detect trends. These areas are affected by seasonal water levels and have been consistently dominated by the same suite of species (*Typha sp.*, *Echinochloa crusgalli*, *L. oryzoides*, and *S. tabernaemontani*) accustomed to high nutrient

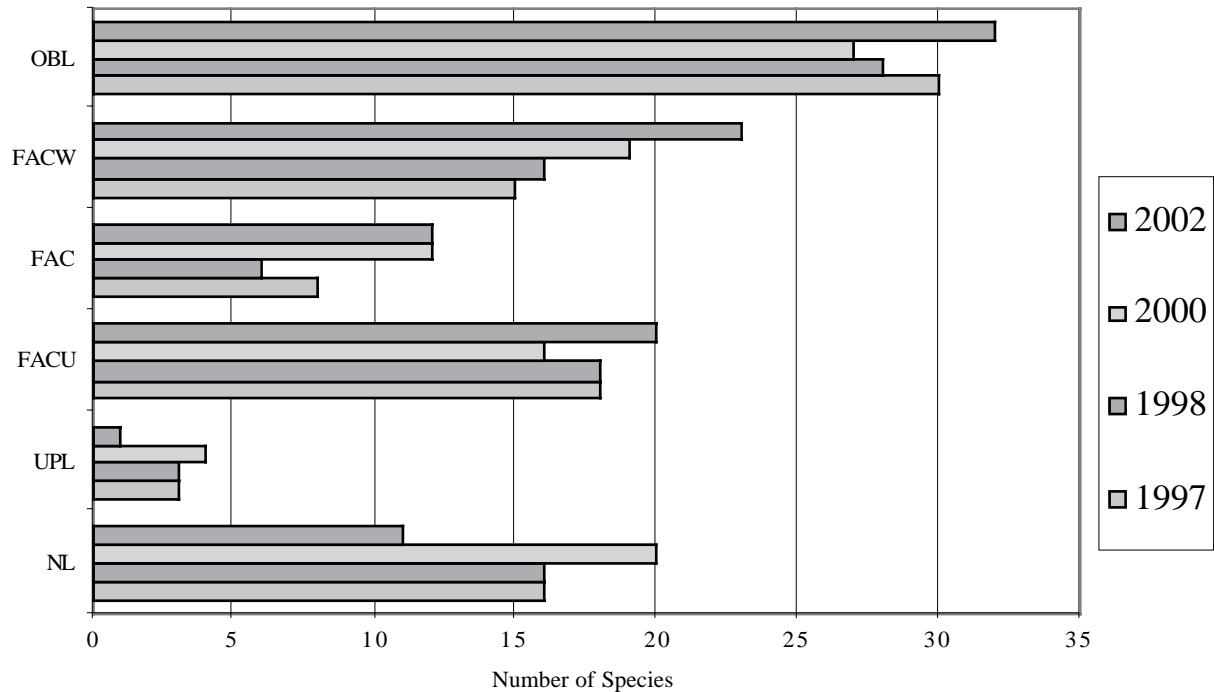


Figure 1. Number of species found in the billabong in 1997, 1998, 2000 and 2002 according to indicator status. Data from 1997 and 1998 presented in Bouchard et al. (1999). OBL = obligate, FACW = facultative wetland, FAC = facultative, FACU = facultative upland, UPL = upland and NL = not listed.

conditions. All species originally planted were observed during this survey except for *A. calamus*, *S. cernuus*, *Equisetum* sp., *C. palustris*, and *Z. aquatica*.

Vegetation Cover

There was significant coverage by vegetation in all habitat zones of the wetland in 2000 and slightly more extensive coverage in 2002 (Figure 2). Along the wetland perimeters (1-2 ft and 2-3 ft) and on the islands, a healthy cover of vegetation has consistently developed. Vegetation in the mudflat portion of the wetland is dependent upon the seasonal subsidence of water during the spring and early summer months. The northern and southern mudflat areas have developed more rapidly with extensive cover by *Typha* sp. As with species richness, overall vegetation cover in July 2002 was affected by an extended period of standing water in the mudflat. With the water receding, greater plant abundance is expected in late summer and autumn.

Other portions of the wetland were well covered. Dense mats of *Eleocharis* spp. provided significant cover along with an increasing coverage by *Salix*. Willow specimens were observed to have recruited into the mudflat portions and it is expected that their overall coverage may continue to increase in the upcoming years. Overall, this wetland continues to progress into a diverse and valuable wetland system.

References

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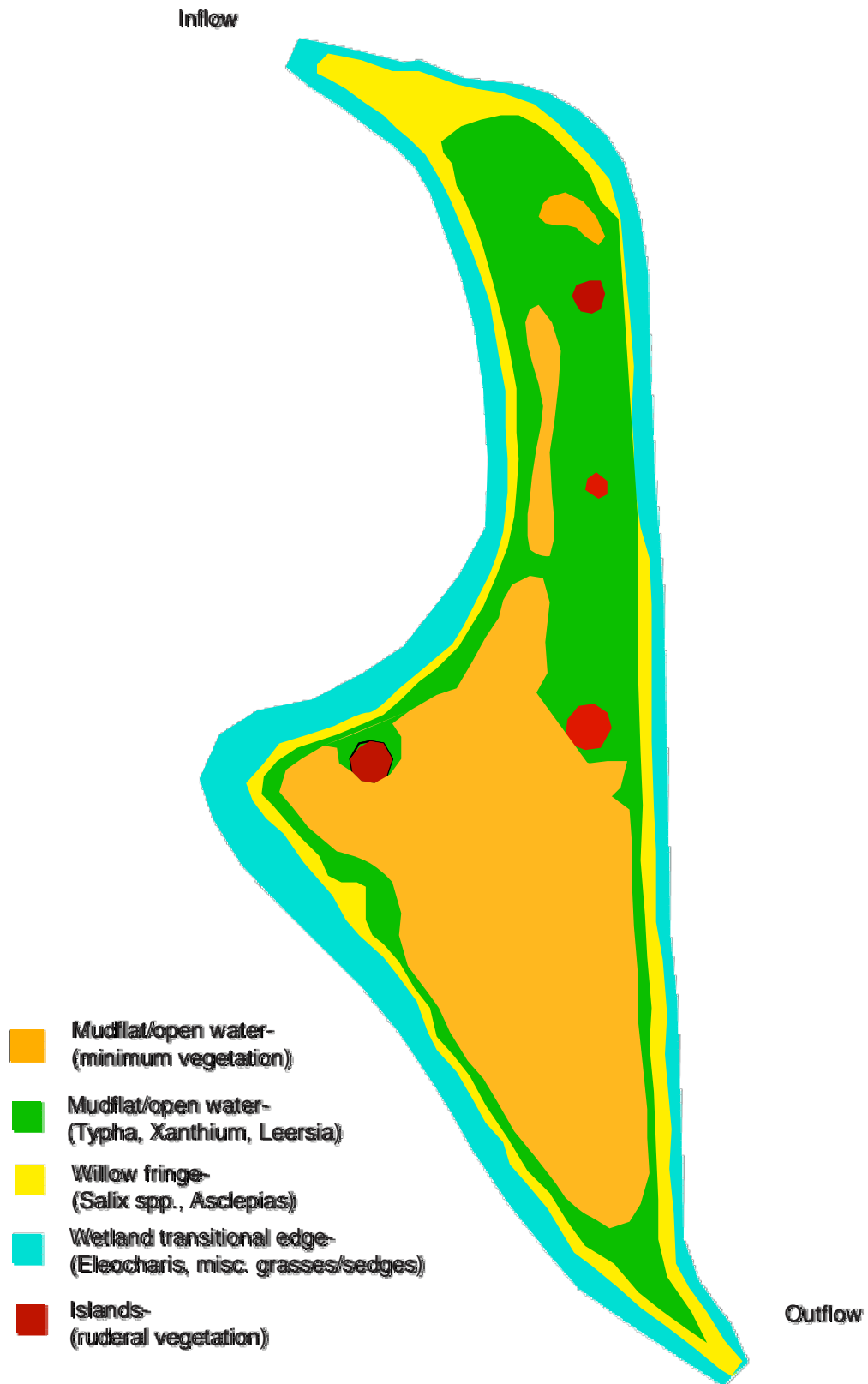


Figure 2. Dominant vegetation communities of the ORWRP billabong wetland, July 2002